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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/649,566	08/27/2003	Chung-Chi Ko	TSM02-1383	5945

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EXAMINER	
DOLAN, JENNIFER M	

ART UNIT	PAPER NUMBER
2813	

DATE MAILED: 08/11/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/649,566	KO ET AL.	
	Examiner	Art Unit	
	Jennifer M. Dolan	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 August 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *12/8/03*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

KD.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 11-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 11 and 12, the claims depend on claim 9, which states that the curing step is a UV treatment, but claims 11 and 12 state that the curing is either a plasma treatment or an e-beam treatment. It is unclear from the claims as to whether the curing step includes both a UV treatment, followed by a plasma treatment or an e-beam treatment, or whether the curing step does not include the limitations of claim 9, despite the dependency. Regarding claim 13, the claim language re-iterates the material of claim 9, and hence, it is not clear as to what is encompassed by claim 13. For the purposes of examination, it is assumed that claims 11 -13 depend on claim 10, rather than claim 9, so that the claimed subject matter corresponds with the specification.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –

> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1, 2, 4-7, 10, 11, 15-17, and 19 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,759,098 to Han et al.

Regarding claims 1 and 5, Han discloses forming a semiconductor structure comprising a low-K dielectric material on a substrate (column 1, lines 25-35), comprising: providing an environment having a regulated temperature between 0-250 degrees C, placing a substrate having a top surface in the environment, and depositing a layer of material (column 5, lines 23-35 and 50-60; a spin on-deposition process for MSQ would be conducted at a temperature lower than the degradation temperature; otherwise, the material would be partially cured during deposition), the material having a dielectric constant of no more than 2.5 (column 7, lines 20-25; also, MSQ generally has a dielectric constant of lower than 2.5); regulating the temperature between 0-400 degrees C, and curing the layer (column 6, lines 35-45).

Regarding claims 2 and 4, Han teaches that the deposition process is a spin-on process (column 5, lines 20-30).

Regarding claims 6, 7, 10, and 11, Han discloses that the curing is a plasma treatment (column 4, lines 54-60; column 6, lines 29-65).

Regarding claims 15-17, and 19, Han discloses that the curing environment includes H_2 and N_2 (column 6, lines 35-45).

5. Claims 1-6, 9, 10, and 13-19 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,756,085 to Waldfried et al.

Regarding claims 1 and 5, Waldfried discloses forming a semiconductor structure comprising a low-K dielectric material on a substrate (column 1, lines 20-40) on a substrate, comprising: providing an environment regulated to between 0-250 degrees C, placing a substrate in the environment, and depositing a layer of material (column 4, lines 25-55; the temperature for a spin-on process must be below 250 degrees C, because above such a temperature, the polymer resin would degrade and harden, such that it is cured during deposition); the material having a dielectric constant of no more than 2.5 and intersecting the range of 1.9-2.5 (column 10, lines 20-24); regulating the temperature between 0-400 degrees C, and curing the layer (column 8, lines 1-45; also see Table 2).

Regarding claims 2, 3, and 4, Waldfried discloses that either CVD or spin-on processes are used to deposit the material (column 4, lines 40-50).

Regarding claims 6, 9, 10, 13, and 14, Waldfried discloses that the curing step is a UV treatment (column 8, lines 1-45).

Regarding claims 15-19, Waldfried discloses that the curing environment includes H_2, N_2, or CO_2 (column 8, lines 5-12).

6. Claims 1-3, 5, 6, 8, 10, 12, 14-17, and 19 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent Publication No. 2003/0211244 to Li et al.

Regarding claims 1 and 5, Li discloses a method of forming a semiconductor structure comprising a low-K dielectric material on a substrate (paragraphs 0003-0004), comprising:

providing an environment regulated to between 0-250 degrees C (paragraphs 0023, 0036; deposition temperature is less than 150 degrees C); placing a substrate in the environment, and depositing a layer of material (paragraphs 0034-0038), the layer having a dielectric constant of no more than 2.5, thus intersecting the range of 1.9-2.5 (paragraph 0015); regulating the temperature to between 0 –400 degrees C, and curing the deposited layer (paragraph 0023; paragraphs 0054-0072).

Regarding claims 2 and 3, Li discloses that a CVD process is used (paragraphs 0036-0039).

Regarding claims 6, 8, 10, 12, and 14, Li discloses that the curing is an e-beam process (paragraphs 0023, 0054-0072).

Regarding claims 15-17, and 19, Li discloses that the curing environment includes H_2 (paragraph 0023).

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a. U.S. Patent Publication No. 2003/0157267 to Waldfried et al. discloses methods for plasma and UV curing of ultra low-k polymers.

b. U.S. Patent No. 5,106,658 to Burkhardt et al. discloses UV curing for low-k materials.

c. U.S. Patent No. 6,251,806 to Chang et al. teaches the benefits of e-beam curing low-k materials.

d. U.S. Patent No. 6,150,232 to Chan et al. suggests that e-beam curing, UV curing, and thermal curing can be used interchangeably.

e. U.S. Patent No. 6,750,141 to Xia et al. teaches the relationship between anneal temperature and dielectric constant for an organosilicate film.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer M. Dolan whose telephone number is (571) 272-1690. The examiner can normally be reached on Monday-Friday 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl W. Whitehead, Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jennifer M. Dolan
Examiner
Art Unit 2813

jmd

CARL WHITEHEAD, JR.
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800